

A STUDY OF THE LAND USE IN SONGHUA RIVER BASIN OF CHINA

ZHANG B., WANG Z. AND DUAN H.

Northeast Institute of Geography and Agricultural Ecology, Chinese Academy of Sciences

1 BACKGROUND

1.1 INTRODUCTION OF NORTHEAST CHINA

As one of the main agricultural regions of the nation, The Northeast has an area of 1,240,000 km². The Northeast China account for 13% and 20% of the area and cultivated land of the whole Country, respectively. In this region, the main crops are spring wheat, spring corn, soybean, rice and beet, etc., grown in the cultivated area which accounts for 30% of the whole area. In 2001, the total crop sown area was 22,476,663 ha, accounting for 14% of crop sown area in the whole country (155,707,900 ha). The whole grain yield was 67,589,800 t, accounting for 15% of the total output of grain of the nation (452,637,000 t). Among them, the output yield of wheat, corn, beans and rice was 1,655,100 t, 114,088,000 t, 8,405,700t and 18,000,000 t, i.e. accounting for 1.76%, 29.96%, 41.49%, and 10% of the total yield of the nation, respectively. In addition, as one of important beet production area, the northeast China had 58% of the sown area for growing sugar beet of the whole nation, with an area of 236,000 ha.

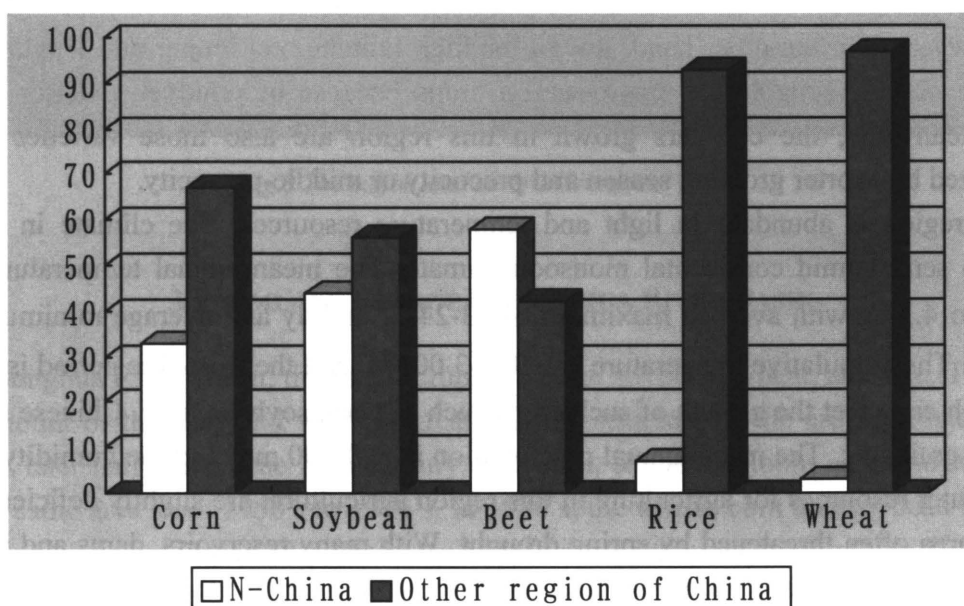


Fig.1 Major crops production proportion

1.2 THE SONGHUA RIVER BASIN

Songhua River is one of seven great rivers in China. The water system of Songhua River consist of the second Songhua River, Nenjiang River and main stream of Songhua River. There are two sources in northern part and southern part of Songhua River, the northern source is Nenjiang River, rising from south Ilehuli Mountain of the northern part of the Da xing'an ling Mountain; and the south source rises from Tianchi Lake in Changbai Mountain. The two sources converge near Fuyu County of Jilin province, flows to the Northeast, then flows into the main stream of Heilongjiang River in Tongjiang County. Among them, the second Songhua Rive has a total length of 958 kilometers and a watershed area of 73,400 square kilometer. The Nenjiang River has a total length of 1370 kilometers and a drainage area of 297,000 square kilometer. The main stream of The Songhua River forms after the second Songhua River and the Nenjiang River converges, with an area of 2328 kilometers and a drainage area of 558,600 square kilometer. The total amount of water resource is 85,150 million cubic meters, ranks the 4th in China.

The area of Songhua River Basin is about 50% of total catchment of Songhua River. Songhua River Basin is located in mid-northern part of Northeast Plain and has become a newly reclaimed farmland area in the 20th century.

2 NATURAL CONDITIONS FOR FARMING IN SONGHUA RIVER BASIN

Songhua River basin (figure 2), have even topography, fertile soils. Main soil types in this region are black soil, meadow soil and swampy soil. In Songhua River Basin, on the one hand, condition of light, temperature and rainfall can supply for crop growth relatively well in cropping season. On the other hand, due to the high latitude and longer and lengthy winter, this region is only suitable for single-season crops because of relatively shorter cropping season. Meanwhile, the cultivars grown in this region are also those varieties that are characterized by shorter growing season and precocity or middle-precocity.

This region is abundant in light and temperature resources. The climate in this area belongs to semi-humid continental monsoon climate. The mean annual temperature ranges from 1.4 to 4.3°C, with average maximum of 23-24°C in July and average minimum -17°C in January. The cumulative temperature is 2 900-3 000°C and the frost-free period is 130-145 days, which can meet the growth of such crops such as corn, soybean, rice, Chinese sorghum, wheat and grain, etc. The mean annual precipitation is 500-600 mm and the humidity index is 0.6-1.0. Water resources for agriculture in this region agricultural are slightly deficient, which made the area often threatened by spring drought. With many reservoirs, dams and irrigation establishments, the surface water resource is relatively abundant. In the Songhua River plain, level of agricultural production is also relatively high and yield of main agricultural products are great. In addition, the commodity rate in this area is high.

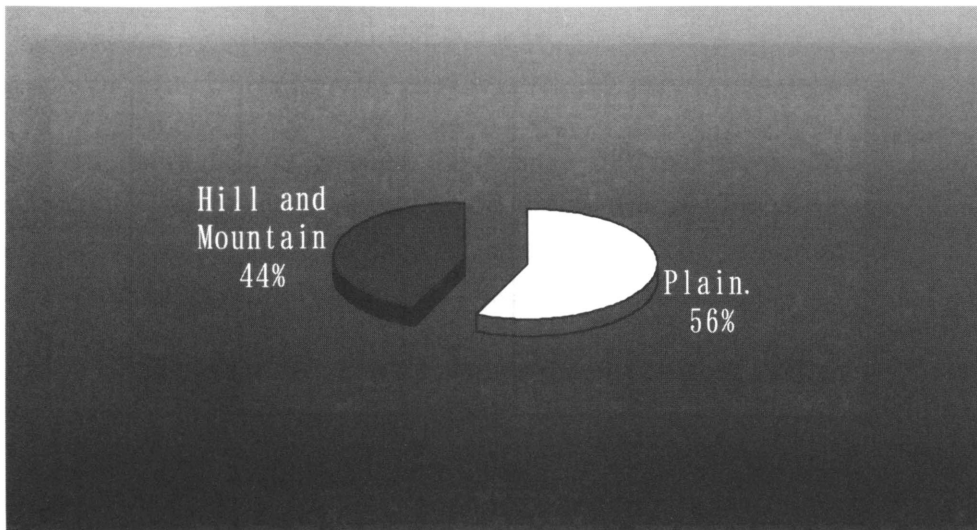


Fig.2 The basic topography in Northeast China

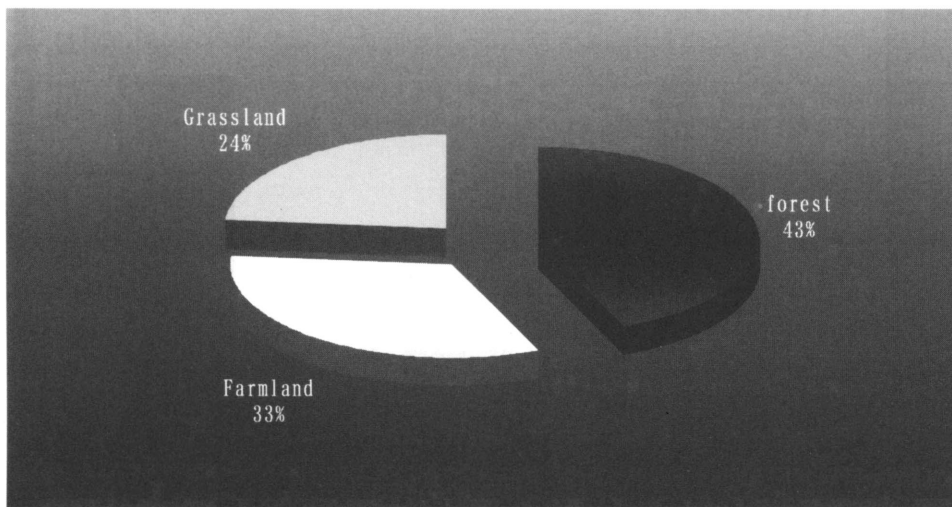


Fig.3 The major land cover in Northeast China

3 FARMLAND CHANGE IN SONGHUA RIVER BASIN

In Songhua River Basin, the major crops are corn, soybean, wheat, and rice. The change of the amount of the cropland was not great, but the structure of the cropland had a drastic change in later half part of the 20th century. The corn, soybean, bloom corn and wheat have the fairly same area from 1950's to 1970's. In 1980's, the wheat, corn and soybean land saw a large scale expansion. Corn and soybean land kept development continuously in the 1990's. In the last 10 years of the 20th century, paddy field had a fast development and become one more important landscape. The corn area has been rising in the past 50 years and occupied a absolutely dominant position with more than 70% of the cropland after the 1970's so that the area were named the 'Corn-Belt of China'. The soybean land kept a long-term stable situation. Another important phenomenon was the relatively great scale expansion of paddy field after 1980.

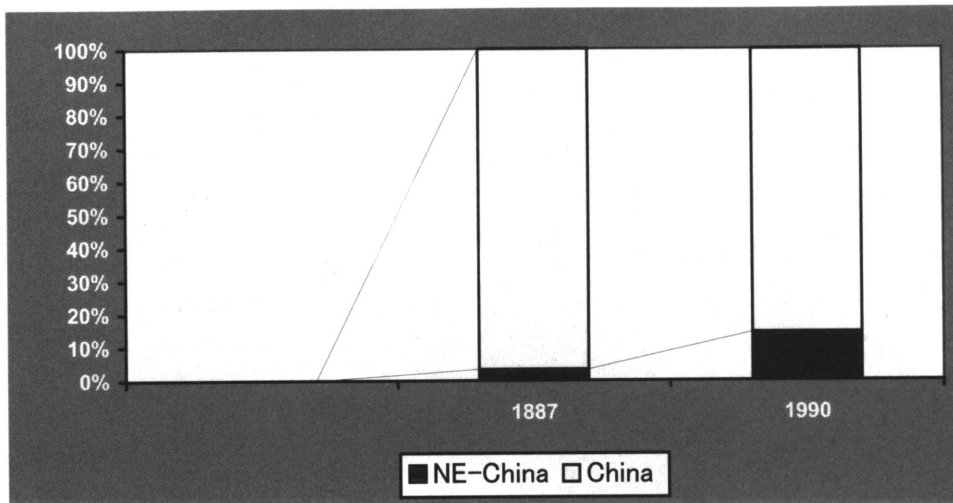


Fig.4 The ratio change of farmland (1887 /1990)

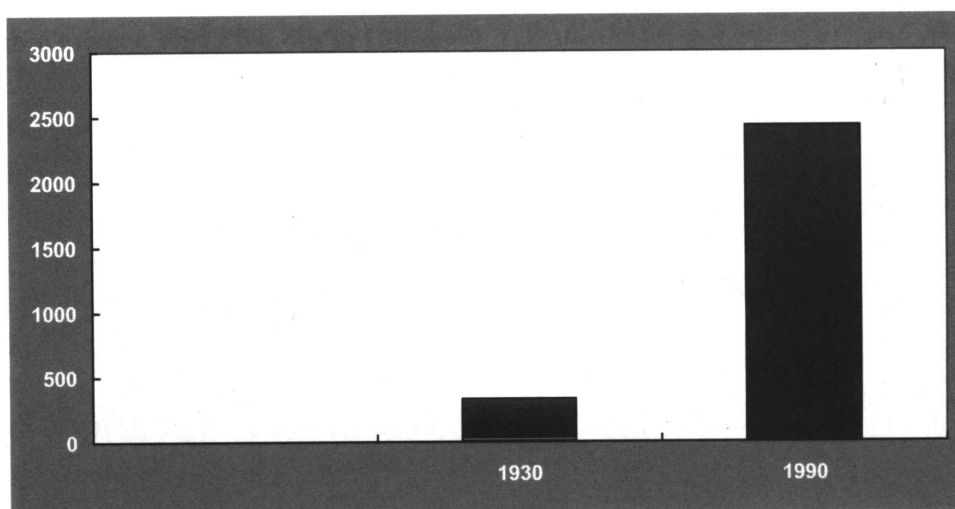


Fig.5 The change of paddy field of Northeast China

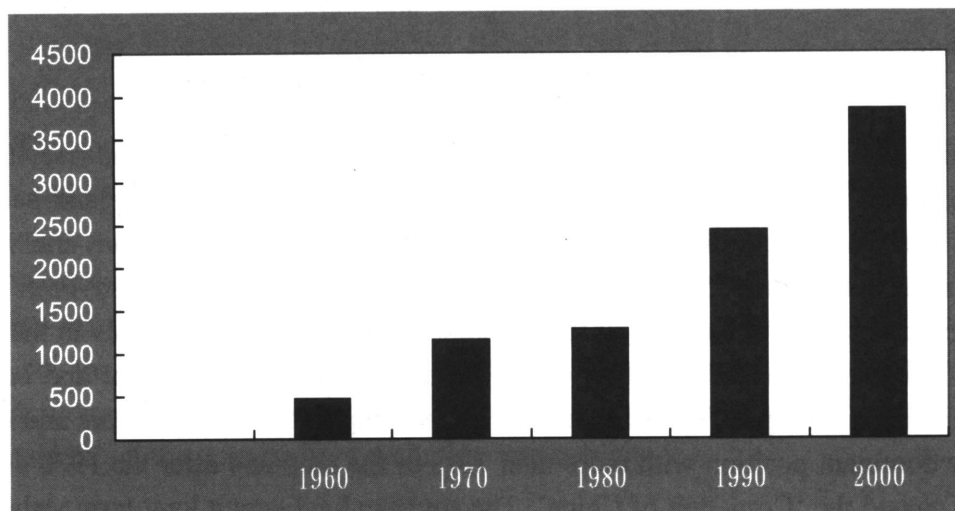


Fig.6 The change of the paddy field in Songhua River Basin

4 ANALYSIS OF MAIN DRIVING FORCES FOR LAND USE CHANGE IN SONGHUA RIVER BASIN

There are many factors causing the change of land use in Songhua River Basin. According to the relationship research, the basic driving forces are quickly increased population, subsequent demand for land reclamation, the introduction of modern agricultural technology, warming up of climate and the change of food structure.

4.1 THE MOVEMENT AND REPRODUCTION OF PEOPLE

In the 20th Century, the great arable land resources of the Northeast China attracted successive waves of people moving northwards. The population of the Northeast China has increased dramatically over the last 100 years (see figure 7 and figure 8), and the farmland per capita decreased sharply(Fig.9).

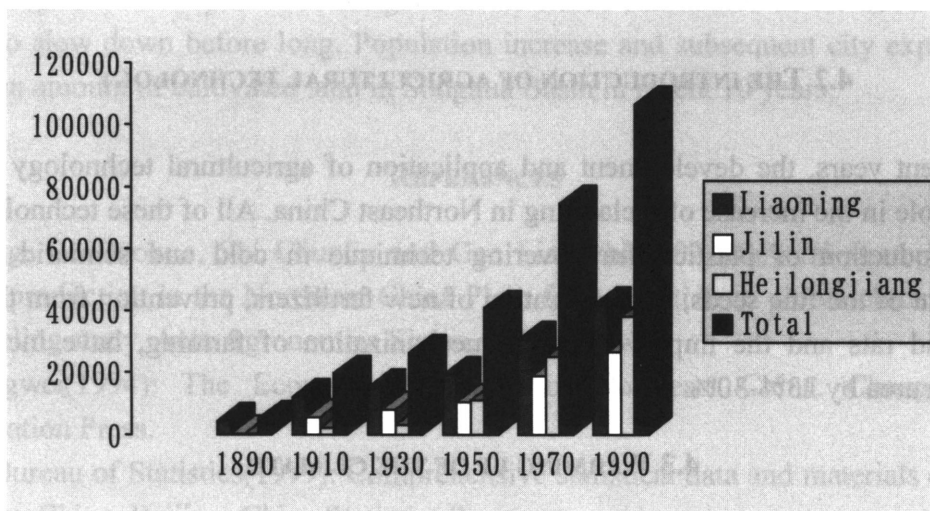


Fig.7 The change of the population in Northeast China (10³)

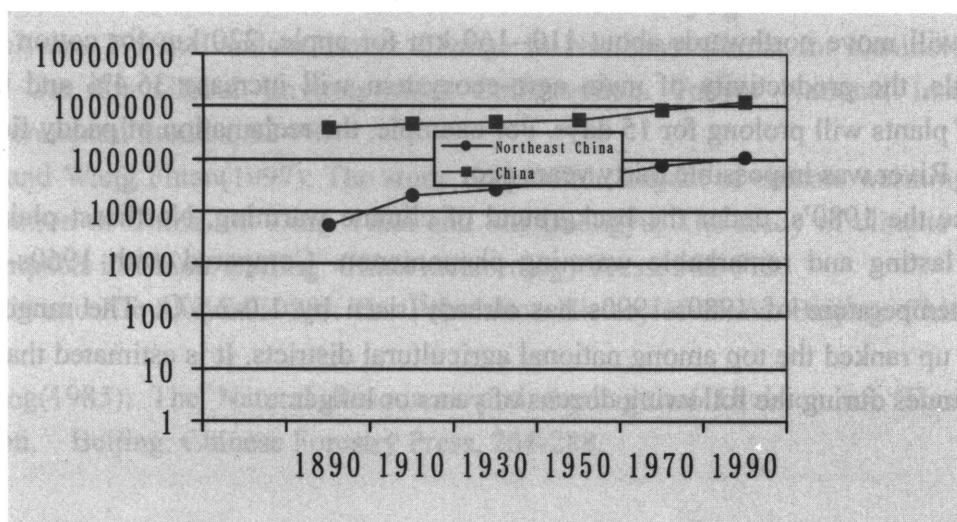


Fig.8 The increasing rate of population

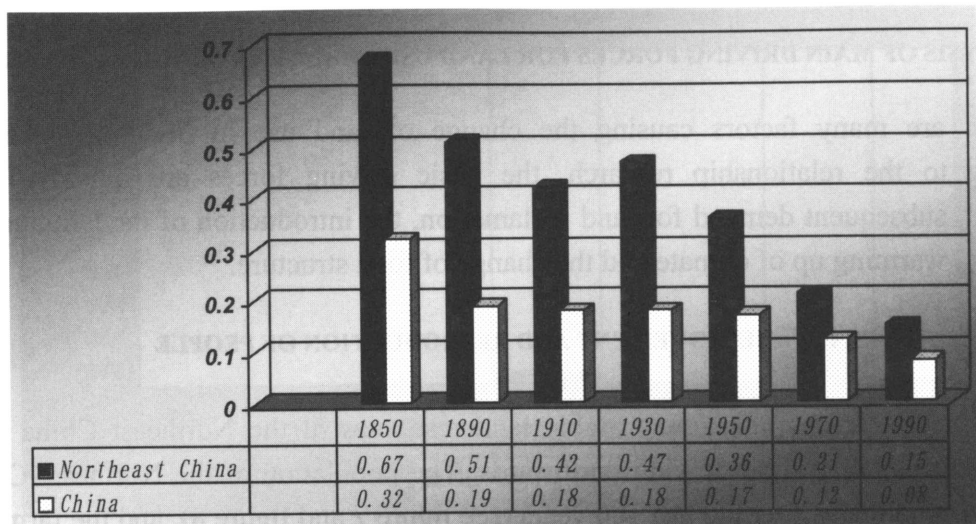


Fig.9 The farmland of person in Northeast China with China (hm^2)

4.2 THE INTRODUCTION OF AGRICULTURAL TECHNOLOGY

In recent years, the development and application of agricultural technology played an important role in the increase of reclaiming in Northeast China. All of these technologies such as the introduction of plastic film covering technique in cold and semiarid areas, the development of the fine seeds, the application of new fertilizers, prevention from the disaster of pests and rats and the improvement of mechanization of farming, have increased the reclamation area by 23%-30%.

4.3 WARMING UP OF THE CLIMATE

Historically, the cold climate hampered the reclaiming of land. However, following the warming up of global climate, more land were reclaimed in Northeast China after the 1900's. According to some researches, if the global temperature increase 2 °C, the northern border for survival will move northwards about 110--160 km for apple, 220 km for cotton and so on. Meanwhile, the productivity of main agro-ecosystem will increase 36.4% and the growth period of plants will prolong for 15 days. For example, the reclamation of paddy field nearing the Usuli River was impossible thirty years ago.

Since the 1980's, under the background of climate warming, Northeast plain in China suffered lasting and remarkable warming phenomenon. Compared with 1960s-1970s, the average temperature of 1980s-1990s has already risen by 1.0-2.5°C. The range extent of warming up ranked the top among national agricultural districts. It is estimated that this trend will continue during the following dozens of years or longer.

5 DISCUSSION

The 20th century is the most important period for land reclaiming in Northeast of China. In this period, the rate, intensity and quantity of the land reclaiming were huge. In the past 100 years the land of more than 100 thousands km² were reclaimed into farmland.

Like many cases in the world, the most important driving factor of land reclaiming in Northeast China is the increase of population (i.e. pressure of population). In the 20th century, the population increased from 11 million to 110 million in Northeast China and from 400 million to 1400 million in China. So increase of population is the most important driving force for land reclaiming.

Because the climate is colder in Songhua River Basin, the agricultural development is later than others areas of China. Fertile and even land made the area become an important food supplying area in China. Due to superior irrigation condition, paddy field development has been an important part of farmland in Songhua River Basin.

The cropland development of Songhua River Basin culminated in the 2000 year and is expected to slow down before long. Population increase and subsequent city expansion also occupied an amount of cultivated land in Songhua Basin in recent 10 years.

REFERENCES

- Jin Zhiqing, Ge Daokuo, Shi Chunlin and Gao Liangzhi(2002): Several strategies of food crop production in the Northeast China Plain for adaptation to global climate change-a modeling study. *Acta Agronomica Sinica*, **28**(12), 24-31.
- Kong Jingwei(1994): *The Economical History of Northeast China*. Changchun: Jilin Education Press.
- National Bureau of Statistics(1999): *Comprehensive statistical data and materials on 50 years of new China*. Beijing: China Statistics Press.
- Sun Jingzhi(1959): *Economical Geography of Northeast Region in China*. Beijing: Science press.
- Wu Chuanjun and Guo Huanchen(1994): *Landuse of China*. Beijing: Sciences Press.
- Yukio Himiyama(1999): Landuse /cover Change in Northeast China, In: Kuninori Otsubo. *Land Use for Global Environmental Conservation*. Tokyo: National Institute for Environmental Studies, 92-98.
- Zhang Yu and Wang Futan(1997): The study on possible impact of climate warming for rice production in China, In: Ding Yihui and Shi Guangyu. *The study of climate warming and impacts in China*. Beijing: China meteorology Press, 508-512.
- Zhao Wenlin and Xie Shujun(1988): *The Population History of China*. Beijing: China People Press.
- Zhu Junfeng(1985): *The Natural Resources and Agricultural Division of "Three-North" Region*. Beijing: Chinese Forestry Press, 264-288.